

Special Issue Reprint

New Advances in Low-Energy Processes for Geo-Energy Development

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This Special Issue highlights pioneering advancements in subsurface energy systems, encompassing hydrocarbon extraction and geothermal utilization through sustainable technological innovations. Featuring multidisciplinary investigations, this research series focuses on optimizing resource recovery while minimizing environmental impacts across unconventional formations and thermal reservoirs. Key contributions demonstrate novel approaches ranging from nanoscale flow behavior analysis in tight formations to integrated geophysical–AI workflows for reservoir characterization. Central research threads examine fracture network engineering, multiphase fluid interactions in extreme-depth environments, coupled thermal-hydro-mechanical simulations, and intelligent production forecasting systems. The volume synthesizes experimental validations, computational modeling breakthroughs, and operational case studies that collectively advance our understanding of energy extraction mechanics. By integrating fundamental scientific discoveries with scalable engineering applications, this compilation establishes critical pathways for developing next-generation eco-efficient energy harvesting technologies across diverse geological settings.



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